Chapter 11 - IMPACT OF MERCURY ON TOURISM AND RECREATION IN NJ

A. Introduction

The Task Force was charged to identify the impact of mercury on tourism and recreation in NJ. This is a sizeable task considering the popularity of fishing and the importance of fish as a vector of mercury. Mercury, or any other pollutant, might have a direct impact on a resource by,
1) rendering it unusable, 2) rendering it inaccessible through regulatory restrictions, 3) adherence to advisories reducing fishing or fish consumption, or 4) accurately or inaccurately altering the public's perception of the acceptability of the resource. However, the fact that NJ has taken an aggressive position about issuing fish consumption advisories may also inspire confidence among fishermen and fish consumers.

B. Data and trends in freshwater and marine fishing in NJ

1. Introduction

Freshwater and saltwater fishing are very popular in NJ and contribute substantially to the economy, particularly along the shore. During the past twenty years there have been two countervailing public messages regarding fish consumption emphasizing benefits and risks. The health benefits of fish consumption have generally been emphasized, while issues concerning contaminants in fish have only attracted attention sporadically. There was, however, a great increase in attention to contaminants in fish from November 2000-January 2001 when mercury and related risks from fish consumption were featured on prime time TV news stories.

If people are influenced by such information in deciding whether or not to go fishing, one might expect to see an impact of the information reflected in either an increase or decrease in the number of people fishing in NJ. Several studies cited in the section on Advisories (Vol. II Chapter 9) emphasize that many fisherfolk are unaware of advisories or choose to ignore them. Such data, however, do not identify would-be fishers who chose not to go fishing because of health concerns.

People could react to fish consumption advisories and other information regarding the hazard posed by elevated mercury levels in fish by:
- Remaining unaware
- Being aware but ignoring such information
- Reaching a decision that it is not a problem for them
- Reducing or changing their consumption patterns
- Continuing to fish but catch and release
- Stopping fishing

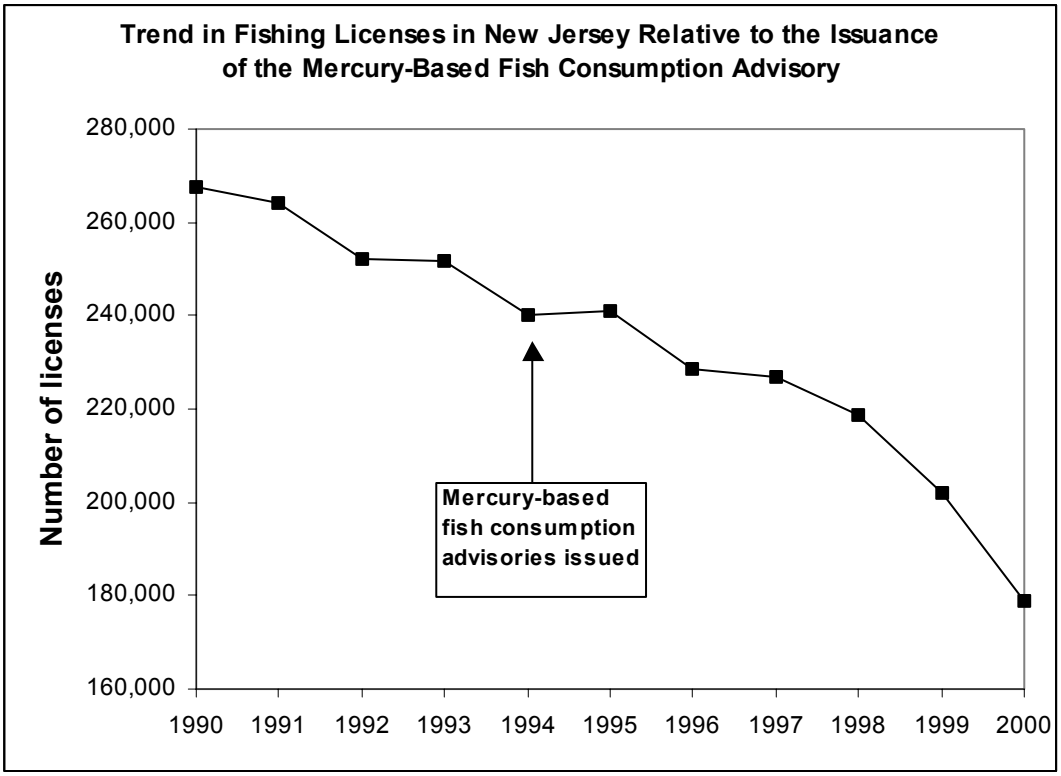
2. Trends in Fishing Licenses and Fishing Statistics

a. Freshwater Licenses

For those people for whom fishing is a long-term hobby it is not likely that they would stop fishing solely on the basis of advisories or word-of-mouth information. On the other hand, novices might choose other hobbies.

To assess the impact of advisories pertaining to freshwater fish on freshwater fishing, the Task Force obtained information on the issuance of resident fishing licenses (freshwater only) for the period 1990-1997 from the NJDEP Division of Fish and Wildlife. At the beginning of the period there were more than a quarter million licenses issued annually (Figure 2.9), but this number has declined to just over 200,000. The decline was already evident by 1991. The arrow shows the time when advisories were issued in 1994. Although the decline in licenses continued, there is no evidence that it was accelerated by the advisories.

Figure 2.9. Trend in Fishing Licenses in New Jersey Relative to the Issuance of the Mercury-Based Fish Consumption Advisory.



Saltwater fishing contributes about $2 billion annually to the NJ economy, with about 75% coming from recreational fishing. With an estimated 841,000 saltwater anglers, NJ ranks 4th in the nation.

b. Saltwater Fishing Statistics

The NJDEP Bureau of Marine Fisheries provided the Task Force data from the National Marine Fisheries Service, which conducts a variety of surveys on coastal fishing activities. The statistics show a big dip in the number of fishers between 1990 and 1992, and then an increase with a peak in 1994, followed by another decline. It is possible that this second decline which coincided approximately with the issuance of the advisories was related to mercury, even though the advisories were specifically for freshwater fish, and not for saltwater fish. The number of person-days fishing did not show any consistent trend and was essentially flat across the period.

c. Official Opinions

The Task Force sought opinions from several officials who would be likely to know of an impact of advisories on fishing. The following offered their opinions:

Gilbert H. Ewing Jr., Chair, NJ Marine Fisheries Council, August 1999,
"The Council is not aware of any documented information regarding the changes in fishermen behavior as a result of concern for mercury pollution."

Robert Soldwedel, NJDEP, Chief, Bureau of Freshwater Fisheries, August 1999.
"It is a fact that there has been a continual downward trend in the sale of fishing licenses in NJ, as well as in most of the other states throughout the country. However, it is extremely doubtful that this decline could be tied into the issue of mercury-based fish consumption advisories. …."

"Fishermen surveys invariably conclude that very few people are interested in taking fish home to eat. Most of the more dedicated fishermen and those in fishing organizations such as the BASS Federation, Trout Unlimited and Muskies Inc wouldn't even consider keeping a fish regardless of its size, because they recognize that it's in the best interest of their future fishing to release all that they catch. Creel censuses have found catch and release rates as high as 95% for Largemouth Bass and Chain Pickerel. …"

"It has been our perception that the fish consumption advisories for mercury have little impact."

The above statement regarding catch-and-release refers mainly to fresh water fishing, since interviews of estuarine and coastal fishermen in the Arthur Kill, Raritan Bay, and north Jersey shore, indicated that 61% of 119 people fishing from shore and 94% of those fishing from boats, responded yes to "do you eat fish you catch" (May and Burger 1996).

3. Boat Captain Survey

Although subsistence fishing has been examined extensively, relatively little attention has focused on organized recreational fishing, such as party and charter boats. Yet, in many coastal states, these boats play a major role in recreational fishing, particularly for estuarine and marine fish. For saltwater fish, NJ issues advisories based on PCBs, not on mercury. However, to determine whether the information on mercury toxicity and the advisories might have affected recreational fisheries, a study led by Dr. Joanna Burger of Rutgers University (in collaboration with NJDEP Division of Science, Research and Technology staff) interviewed fishing boat captains on their views (Burger et al., 2001). It must be stressed that this study obtained opinions, and did not try to determine the accuracy of these captains' opinions.

The interviews of NJ party and charter boat captains asked about (1) knowledge about consumption advisories; (2) current and potential communications about advisories to clients; and (3) perception of whether advisories affect fishing. Additional information collected from boat captains during the interviews (frequency and nature of fishing activities, etc.) appears in a separate report (Burger et al., 2001).

From March through May 2000, 93 captains were interviewed by telephone. This was 40% of the 231 registered boat captains in NJ. Another 40% could not be contacted. All but eight of the remainder was willing to participate, but could not arrange a mutually convenient time to be interviewed before their intense fishing season started at the end of May. Of the respondents, 55% were full-time boat captains. The main fish sought were Flounder/Fluke, Bluefish, Striped Bass, Weakfish, and Tuna. Only a small percentage of trips were for Swordfish and Shark, predatory species that are likely to have high mercury levels.

The vast majority (94%) of respondents said they had heard about fish consumption advisories, but their knowledge of these was mixed. Of the 82 captains who said what they had heard about health warnings on fish, 35% mentioned PCBs (13% linked the contaminant to Striped Bass, particularly in the Hudson River. Bluefish also were often mentioned as contaminated with PCBs); 29% mentioned mercury. Several captains erroneously cited particular contaminants or affected species, or mentioned erroneous problems (e.g., lesions on fish) and solutions (e.g., proper preparation or storage removes contamination). Only six captains cited limits on the amount of certain species that one should eat. Surprisingly, about 23% had not heard of the *NJ Fish and Wildlife Digest*, which is the DEP's primary means of conveying information about advisories to anglers.

As for current communications, only 12% of captains said that they currently posted advisories. Some 82% of captains said that customers were aware of advisories, but many fewer thought customers were aware of the actual content of the advisories (e.g., only 20% thought customers were aware of mercury advice). About half said customers had asked about the safety of fish (9% often, 40% sometimes).

The responses captains reported providing to these customers were diverse. Eight of the captains mentioned specific species to avoid, usually Bluefish and Striped Bass. Others mentioned general guidelines (e.g., it "depends on the species," "size of the fish", or the "amount one eats") or categories. Some answers were conflicting, such as (avoid or eat only "bottom feeders"). Nine captains gave advice on how to prepare fish to avoid problems (e.g., "don't eat the dark meat," "always remove the blood line," "filet and skin") which is accurate for dealing with PCBs, but not mercury. Two captains said this is a problem only if one fishes in other than "clean" water, although water column pollution is not the primary source of fish contamination, and many contaminated fish migrate. Some 19% of all boat captains interviewed said there was no problem with fish safety at all. About a third (37%) of the boat captains said they would post consumption warnings if they were provided by the State; another 21% were not sure, with most of the latter saying it would depend on the advisories' content and presentation. Captains who felt public health warnings had affected their business were not less likely to say they would post advisories than other captains.

Boat captains were asked to rate the importance of various factors in the quality of their fishing seasons. Fishing management regulations, the strength of the overall economy, fishing success of clients, and business costs were all cited by 80% or more captains. Competition from commercial fishing boats and the declining size of available fish were cited by over two-thirds. Some 47% of captains cited "public health advice/warnings about saltwater fish contaminants" as a strong or moderate factors in the quality of their fishing season, ranking it seventh (of 13

factors) in importance. Just under a third (31%) felt advisories affected business strongly. About 36% of the captains reported that former customers had decided to stop fishing, but advisories were not reported as among the reasons given.

Captains who took more trips for Bluefish, Fluke, Sea Bass, and Thresher Shark were somewhat more likely to think that advisories affected their business than did those who did not seek these species very often. Bluefish is the only one of these species that is subject to advisories, in this case for PCBs, and this species has a moderately elevated concentration of mercury. There were no differences for those who took trips for Swordfish, Marlin, Stripped Bass, Tuna, or other Shark species, all species with moderate to high mercury values. Captains who felt advisories were affecting their businesses worked closer to areas (e.g., Raritan Bay Complex and New York Harbor) subject to PCB advisories than did other captains, and were more prone to respond that management regulations (e.g., size, limits, seasons) and marketing and advertising by the industry or State were strong influences on the success of their seasons.

C. Summary and Conclusions: Impact of Mercury on Tourism and Recreation in NJ

Many social and economic factors affect the popularity of any recreational activity. The Task Force found no clear evidence that the issuance of fish advisories or the rising public concern about mercury have had a major influence on freshwater or saltwater fishing. Although the number of fishing licenses has declined, the decline did not coincide with the issuance of advisories. Although concerns over PCBs (through saltwater advisories) may have impacted fishing, these advisories were not based on mercury.

About a third of party and charter boat captains, particularly in northern NJ, reported that advisories did hurt their business to a greater or lesser degree. The Boat Captain Survey was not able to evaluate the accuracy of these reports. Reporting that advisories affected business, however, was consistent mainly for those captains who fished for Bluefish, in the waters of the northern part of the state. It is notable that although bluefish have moderately elevated levels of mercury, there is no mercury-based advisory for Bluefish. There are, however, PCB-based advisories for Bluefish in the waters of northern NJ (i.e., the Harbor Estuary). Furthermore, captains who fished for species with more elevated levels of mercury, species which have been highlighted in the press as posing a potential health hazard (i.e., Shark, Tuna), did tend to identify advisories as affecting their business. This survey cannot rule out a small impact from fish consumption advisories in general on the recreational fishing industry in NJ. It seems unlikely that mercury-based advisories in particular have any major impact on the industry. These results indicate that fish advisories may have had a modest impact on the popularity of saltwater fishing in NJ. However, the incomplete information reported by captains suggests that an outreach campaign to boat captains and improved media reporting should provide accurate information, and should include the brochures already published by NJDEP. This campaign may increase the popularity of catch-and-release activities.

D. Recommendations

Advisories should be timely, requiring periodic monitoring of mercury levels in different kinds of fish that are sought by recreational fishers.

Boat captains should be encouraged to post advisories relevant to their fishing activities and should be provided with advisory handouts that present balanced information.

ACRONYMS

Fg	microgram
ACGIH	American Conference of Governmental Industrial Hygienists
ASMN	Ambient Stream Monitoring Network
ATSDR	Agency for Toxicology and Disease Registry
AVS	Acid volatile sulfide
BBEP	Barnegat Bay Estuary Program
BSDW	Bureau of Safe Drinking Water
CF	Concentration Factor
CSFII	Continuing Survey of Food Intake by Individuals
CWS	Community Water Systems
DELEP	Delaware Estuary Program
DFW	Division of Fish and Wildlife
DSRT	Division of Science, Research and Technology
ER-M	Effects Range-Medium
GIS	Geographical Information System
GSI	Gonadsomatic Index
HEP	Harbor Estuary Program
HQ	Hazard Quotient
Kg	Kilogram
LOAEL	Lowest-observed-adverse-effect-level
LSI	Liversomatic Index
MCL	Maximum Contaminant Level
MeHg	Methylmercury
MRL	Minimum Risk Level
NAWQA	National Water Quality Assessment
NERP	National Environmental Research Parks
NESCAUM	Northeast States for Coordinated Air Use Management
NEWMOA	Northeast Waste Management Officials' Association
NFTDR	National Fish Tissue Data Repository
ng	Nanogram
NHANES	National Health and Nutrition Examination Survey
NJADN	NJ Atmospheric Deposition Network
NJDEP	NJ Department of Environmental Protection
NJDHSS	NJ Department of Health and Senior Services
NJDOH	NJ Department of Health
NJHDG	NJ Harbor Dischargers Group
NJMSC	NJ Marine Sciences Consortium
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No-observed-adverse-effect-level
NPL	National Priorities List
NRC	National Research Council
NSCRF	National Study of Chemical Residue
ODES	Ocean Data Evaluation System
PCBs	Polychlorinated biphenyls
PLW	Pompton Lakes Works
PMA	Phenyl mercuric acetate
POET	Point-of-entry-treatment

ppb	Part per billion
ppm	Part per million
ppt	Part per trillion
RELMAP	Regional Langranian Model Air Pollution
R-EMAP	Regional Environmental Monitoring & Assessment Project
RfC	Reference Concentration
RfD	Reference Dose
TEAM	Trace Element Analysis Model
TSC	Tissue Screening Concentrations
US E.P.A.	US Environmental Protection Agency
USFDA	US Federal Drug Administration
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
WHO	World Health Organization
WQC	Water Quality Criterion
WQS	Water Quality Standard

REFERENCES AND BIBLIOGRAPHY

Abbasi, S.A., and R. Soni (1983) Stress-induced enhancement of reproduction in earthworms, Octochaetus pattoni, exposed to chromium (VI) and mercury (II) - implications in environmental Management. Int. J. Environ. Stud. 22: 43-47.

Academy of Natural Sciences, Philadelphia (ANSP) (1994a) Preliminary assessment of total mercury in fish from lakes, rivers, and reservoirs of NJ. Report to the NJDEPE, Division of Science and Research, Report No. 93-15F, 92 pp.

Academy of Natural Sciences, Philadelphia (ANSP) (1994b) Preliminary assessment of mercury in freshwater fish from Camden County, New Jersey, Rept. No. 94-22D, 21 pp.

Academy of Natural Sciences, Philadelphia (ANSP) (1994c) Total mercury concentrations in fishes from three Hackensack Water Company reservoirs, Rept. No. 94-16F, 28 pp.

Academy of Natural Sciences, Philadelphia (ANSP) (1999) . Phase II 1999 assessment of total mercury concentrations in fishes from rivers, lakes, and reservoirs of New Report to the NJDEP, Division of Science and Research, Report No. 99-.7R, 162 pp.

Adams, D. A., J. S. O'Connor, and S. B. Weisberg (1996) Sediment Quality of the NY-NJ Harbor System. Draft Final Report. USEPA Region 2 and Versar, Inc.

Agocs, M.R., R. Etzel, R. Parrish, D. Paschal, P. Campagna, D. Cohen, E. Kilbourne and J. Heese (1990) Mercury exposure from interior latex paint, New England J. Of Medicine 323:1096-1101.

Anderson, A.C. and Rice, J.C. (1993) Survey of fish and shellfish consumption by residents of the greater New Orleeans area. Bull. Environ. Contam. Toxicol. 51:508-514.

Andren, A. and J.O. Nriagu (1979) The global cycle of mercury. In: The Biogeochemistry of Mercury in the Environment (J.O. Nriagu, Ed.), Elsevier-North Holland, Amsterdam. Pp. 1-21.

Armstrong, F.A.J. (1979) Effects of mercury compounds on fish. Pages 657-670 in J. O. Nriagu (ed.). The biogeochemistry of mercury in the environment. Elsevier/North-Holland Biomedial Press, New York.

Agency for Toxic Substances and Disease Registry (ATSDR) (1993) Toxicological Profile for Lead - Update. US Department of Health and Human Services, Public Health Service, TP-92/12.

Agency for Toxic Substances and Disease Registry (ATSDR) (1999a) Toxicological Profile for Mercury. US Department of Health and Human Services, Public Health Service. March 1999.

Agency for Toxic Substances and Disease Registry (ATSDR) (1999b) Toxicological Profile for Lead. US Department of Health and Human Services, Public Health Service, PB/99/1166704.

Aucott, M. (2000) Personal communication.

Babiart, C.L., S.R. Hoffman, M.M. Shager, J.P. Hurley, A.W. Andren, & D.E. Armstrong (2000). A critical evaluation of tangential-flow ultrafiltration for trace metal studies in freshwater systems, 2. Total mercury and methylmercury, Environ. Science Technol. 34:3428-3434.

Bache C.A., W.H. Gutenmann and D.J. Lisk (1971) Residues of total mercury and methyl mercury in lake trout as a function of age. Science 172:951.

Barr, J.F. (1986) Population dynamics of the Common Loon (*Gavia immer*) associated with mercury-contmainated waters in northwestern Ontario. Occasional Paper No. 56, Canadian Wildlife Service.

Barringer, J.L., C.L. MacLeod, & R.A. Gallagher (1997) Mercury in ground water, soils and sediments of the Kirkwood-Cohansey Aquifer System in the New Jersey Coastal Plain, USGS Open-File Report 95-475, 260 pp.

Barringer, J.L. & C.L. MacLeod (1998) (DRAFT) Relation of mercury to chemical constituents in ground water in the Kirkwood-Cohansey Aquifer System, New Jersey Coastal Plain, and mechanisms for mobilization of mercury from sediments to ground water, Water-Resources Investigations Report 98-DRAFT.

Baumann, J., M.T. Bender and J.M. Williams (2000) Fishing for Trouble: A survey of mercury contamination in America's waterways. Mercury Policy Project and California Communities Against Toxics, and PIRG http://www.pirg.org/reports/enviro/merc.htm

Beijer K, and A. Jernelöv (1979) Methylation of mercury in aquatic environments, pp.203-210 in The Biogeochemistry of Mercury in the Environment (Nriagu JO, ed) Amsterdam: Elsevier/North Holland.

Bemis, J.C., and R.F. Seegal (1999) Polychlorinated biphenyls and methylmercury act synergistically to reduce rat brain dopamine content in vitro. Environ. Health. Perspect. 107:879-885.

Benoit, J.M., W.F. Fitzgerald and A.W.H. Damman (1994) Historical atmospheric mercury deposition in the mid-continental United States as recorded in an ombrotrophic peat bog. In Mercury as a Global Pollutant: Towards Integration and Synthesis. C.J. Watras and J.W. Huckabee, editors. Lewis Press, Boca Raton, FL pp. 187-202.

Benoit, J.M., W.F. Fitzgerald & A.W.H. Damman (1998) A biogeochemistry of an ombrotrophic bog: evaluation of use as an archive of atmospheric mercury deposition. Environmental Research Station, Section A 78, p. 118-133.

Benoit, J.M., Gilmour, C.C. and Mason, R.P. (2001a). Aspects of bioavailability of mercury for methylation in pure cultures of *Desulfobulbus proprionicus (1pr3).* Appl. Environ. Microbiol. 6751-58.

Benoit, J.M., Gilmour, C.C., and Mason, R.P. (2001b). The influence of sulfide on solid-phase mercury bioavailability for methylation by pure cultures of *Desulfobulbus propionicus (1pr3).* Environ Sci Technol. 35:127-132.

Berman M. and R. Bartha (1986a) Levels of chemical versus biological methylation of mercury in sediments. Bull Environ Contam Toxicol 36:401-404.

Berman, M., and R. Bartha (1986b) Control of the methylation process in a mercury-polluted aquatic sediment. Envir. Pollution (Series B) 11: 41-53.

Best, J.B., M. Morita, J. Ragin and J. Best Jr. (1981) Acute toxic responses of the freshwater planarian, Dugesia dorotocephala, to methylmercury. Bull. Environ Contam Toxicol. Jul;27(1):49-54.

Beusterien, K., R. Etzel, M. Agocs, G. Egeland, E. Socie, M. Rouse and B. Mortensen (1991) Indoor air mercury concentrations following application of interior latex paint, Arch. Environ. Contam. Toxicol. 21:62-64.

Beyer, W.N., E. Cromartie, and G.B. Moment (1985) Accumulation of methylmercury in the earthworm, Eisenia foetida, and its effects on regeneration. Bull. Environ. Contam. Toxicol. 35: 157-162.

Bidstrup, L., J.A. Bonnell, D.G. Harvey, and S. Locket (1951) Chronic Mercury Poisoning in Men Repairing Direct Current Meters, Lancet 2:856-861

Biester, H., M. Gosar, S. Covelli (2000) Mercury speciation in sediments affected by dumped mining residues in the drainage area of the Idrija mercury mine, Slovenia, Environ. Sci. & Tech. 34: 3330-3336.

Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. (1979) The effects of mercury on reproduction of fish and amphibians. In J.O. Nriagu (ed.) The Biogeochemistry of Mercury in the Environment. Elsevier, Amsterdam, The Netherlands, pp. 629-656.

Bloom N.S. (1992) On the chemical form of mercury in edible fish and marine invertebrate tissue. Can J Fish Aquatic Sci 49:1010-1017.

Bodaly, R.A. & R.E. Hecky (1979) Post-impoundment increases in fish mercury levels in the southern Indian Lake Reservoir, Manitoba. Can. Fish. Mar. Serv., Manuscript Rep. 1531, 15 pp.

Bopp, R.F., H.J. Simpson, S.N. Chillrud, D.W. Robinson (1993) Sediment-derived chronologies of persistent contaminants in Jamaica Bay, NY. Estuaries. V. 16. No. 3B: 608-616.

Borg, K., K. Erne, E. Hanko, and H. Wanntorp (1970) Experimental secondary methyl mercury poisoning in the Goshawk (*Accipiter gentilis*) Environ Pollut. 1: 91-104.

Bowerman, W.W. IV, E.D. Evands, J.P. Giesy, and S. Postupalsky (1994) Using feathers to assess risk of mercury and selenium to Bald Eagle reproduction in the Great Lakes region. Arch. Environ. Contam. Toxicol. 27:294-298.

Braune, B.W. and D.E. Gaskin (1987) Mercury levels in Bonaparte's Gull (*Larus philadelphia*) during autumn molt in the Quoddy region, New Brunswick, Canada. Arch. Environ. Contam Toxicol. 16: 539-549.

Brosset, C. and E. Lord (1995) Methylmercury in Ambient Air. Method of Determination and Some Measurement Results. Water, Air, and Soil Pollution 82: 739-750.

Burger, J. (1992) Trace element levels in Pine Snake hatchlings: tissue and temporal differences. Arch. Environ. Contam. Toxicol. 22: 209-213.

Burger, J. (1993) Metals in avian feathers: bioindicators of environmental pollution. Review Environ. Toxicol. 5:203-311.

Burger, J. (1995) Heavy metal and selenium levels in feathers of Herring Gulls (*Larus argentatus*): differences due.

Burger, J. (1997a) Heavy metals in the eggs and muscle of Horseshoe Crabs (*Limulus polyphemus*) from Delaware Bay. Environ. Monitor. Assess. 46: 279-287.

Burger, J. (1997b) Heavy metals and selenium in Herring Gulls (*Larus argentatus*) nesting in colonies from eastern Long Island to Virginia. Environ. Monitor. Assess. 48: 285-296.

Burger, J. (1998) Fishing and risk along the Savannah River: possible intervention, J. Toxicol. Environ. Health 55,405-419.

Burger J., and M. Gochfeld (1985) Comparison of nine heavy metals in salt gland and liver of Greater Scaup (*Aythya marila*), Black Duck (*Anas rubripes*) and Mallard (*A. Platyrhynchos*) Comp. Biochem. Physiol. 81C: 287-292.

Burger, J. and M. Gochfeld (1988) Metals in tern eggs in a New Jersey estuary: a decade of change. Environ. Montor Assess 11: 127-135.

Burger, J. and M. Gochfeld. (1996). Fishing advisories: useful or difficult to interpret? Risk: Health, Safety & Environment 23:23-33.

Burger, J. and M. Gochfeld (1997) Risk, mercury levels, and birds: relating adverse laboratory effects to field biomonitoring. Environ. Research 75: 160-172.

Burger, J., J. Sanchez and M. Gochfeld (1998) Fishing, consumption, and risk perception in fisherfolk along an East Coast Estuary. Environmental Research (A) 77:25-35.

Burger, J. and M. Gochfeld (2001) Effects of chemicals and pollution on seabirds. Pp. 485-526 in Biology of Marine Birds (Schreiber, E.A. and Burger, J. eds) CRC Press, Boca Raton, FL.

Burger, J. and Gochfeld, M. (2001) On developing bioindicators for human and ecological health. Environmental Monitoring and Assessment 66: 23-46.

Burger, J. and J. Snodgrass (1998) Heavy metals in Bullfrog (*Rana catesbeiana*) tadpoles: effects of depuration before analysis. Environ. Toxicol. Chem. 17:2203-2209.

Burger, J., and L. Waishwell (2001) Are we reaching the target audience? Evaludation of a fish fact sheet. Science Total Environ. 277:77-86.

Burger, J., M. Gochfeld, A.A. Rooney, E.F. Orlando, A.R. Woodward and L.J. Guillette, Jr. (2000) Metals and metalloids in tissues of American Alligators in three Florida lakes. Arch. Environ. Contam. Toxicol. 38:501-508.

Burger, J., C.S. Borning, W.L. Stephens, J. Snodgrass, J. and M. Gochfeld (2001a) Mercury and selenium in fish from the Savannah River: species, trophic level, and locational differences. Environ. Research A87:108-118.

Burger, J., K.R. Gaines, and M. Gochfeld (2001b) Ethnic Differences in Risk from Mercury Among Savannah River fishermen. Risk Analysis. In Press.

Burger, J., M. Gochfeld, and C. Leck (1984) Waterbirds on Raritan Bay: a preliminary analysis of their distribution and heavy metal levels. NJ Academy of Sciences.

Burger, J., M. Gochfeld, C.W. Powers, L. Waishwell, C. Warren and B.D. Goldstein, (2001c) Science, policy, stakeholders and fish consumption advisories: developing a fish fact sheet for the Savannah River. Environ. Management 27:501-514.

Burger, J., Pflugh, K.K., Lurig, L., von Hagen L, and Von Hagen S. 1999. Fishing in urban New Jersey: ethnicity affects information sources, perception and complaince. Risk Analysis 19:427-438.

Burger, J., B. Johnson and M. Gochfeld. In press. Perceptions of recreational fishing boat captains: knowledge and effects of fish consumption advisories. Risk Analysis.

Burger, J., R.A. Kennamer, I.L. Brisbin Jr., and M. Gochfeld (1997) Metal levels in Mourning Doves from South Carolina: potential hazards to doves and hunters. Environ Research 75:173-186.

Burger, J., K. Parsons, T. Benson, T. Shukla, D. Rothstein, and M. Gochfeld (1992) Heavy metal and selenium levels in young Cattle Egrets from nesting colonies in the northeastern United States, Puerto Rico, and Egypt. Arch. Environ. Contam. Toxicol. 23: 435-439.

Burger, J., K. Staine, K., and M. Gochfeld. (1993) Fishing in contaminated waters: knowledge and risk perception of hazards by fishermen in New York City. J. Toxicol. Environ. Health 39:95-105.

Burger, J., Sanchez J. & Gochfeld, M. 1998. Fishing, consumption, and risk perception in fisherfolk along an East Coast estuary. Environmental Research 77:25-35.

Burger, J., W. Stephens, C.S. Boring, M. Kuklinski, J.W. Gibbons, and M. Gochfeld (1999) Factors in exposure assessment: ethnic and socioeconomic differences in fishing and consumption of fish caught along the Savannah River, Risk Anal. 19, 421-431.

Callahan, P. and J.S. Weis. (1983) Methylmercury effects on regeneration and ecdysis in fiddler crabs (Uca pugilator, U. pugnax) after short-term and chronic pre-exposure. Arch. Envir. Contam. Tox., 12:707-714.

Carpi, A., Lindberg, S.E., Prestbo, E.M., et al. (1998) Methylmercury contamination and emission to the atmosphere from soil amended with municipal sewage sludge. J. Env. Qual. 26:1650-1655.

Ceccine, G.A., III 1997. Combinations of natural and anthropogenic stressors affect populations of freshwater rotifers. Thesis (Ph.D.) Georgia Institute of Technology. 1997. 137p.

Centers for Disease Control (1996) Mercury exposure among residents of a building formerly used for industrial purposes, NJ 1994. MMWR 45:422-445.

Cernichiari, E., T.Y. Toribara, L. Liang, D.O. Marsh, M.W. Berlin, G.J. Myers, C. Cox, C.F. Shamlaye, O. Choisy, and P. Davidson (1995) The biological monitoring of mercury in the Seychelles study. Neurotoxicology 16:613-628.

Clark, K.E., L.J. Niles (1999) Status and Trends of Contaminant Concentrations in Raptors: Stressor-Condition Indicator Linkages. NJDEP/ESNP. Division of Fish and Game (Unpublished)

Clarkson, T.W., R. Hamada, and L. Amin-Zaki (1984) Mercury. In J.O. Nriagu (ed) Changing metal cycles and human health. Springer-Verlag, Berlin.

Cohen, J.B., J.S. Barclay, A.R. Major, and J.P. Fisher (1999) Wintering Greater Scaup as biomonitors of metal contamination in Federal Wildlife Refuges in the Long Island Sound region. Manuscript.

Cope W.G., J.G. Wiener, and R.G. Rada (1990) Mercury accumulation in Yellow Perch in Wisconsin seepage lakes: relation to lake characteristics. Environ Toxicol Chem 9:931-940.

Costa, H.J. and T.C. Sauer (1994) Distributions of chemical contaminants and acute toxicity in Delaware Estuary sediments. Final Report, DELEP #94-08. For Delaware Estuary Program, US Environmental Protection Agency, by Arthur D. Little, Inc., Cambridge, MA. 89 pp. and appendices.

Cramer, G.M. (1994) Exposure of US consumers to methylmercury from fish. In: DOE/FDA/EPA Workshop on Methylmercury and Human Health. March 22-23, 1994, Bethesda, MD. Biomedical and Environmental Assessment Group, Brookhaven National Laboratory, Upton, NY, Conf-9403156. pp. 103-116.

Cramer, J.S. (ed) (1995) Special Issue: Methylmercury and Human Health. NeuroToxicology 16(4):577-731.

Crump, K.S., T. Kjellstrøm, A.M. Shipp, A. Silvers, and A. Stewart (1998) Influence of Prenatal Mercury Exposure Upon Scholastic and Psychological Test Performance: Benchmark Analysis of New Zealand Cohort. Risk Analysis 18:701-713.

D'Itri, F.M. (1990) The biomethylation and cycling of selected metals and metalloids in aquatic sediments. In: Sediments: Chemistry and Toxicity of In-Place Pollutants. R. Baudo, J. Giesy, and H. Muntau (Eds.) Lewis Publishers, Inc., Ann Arbor. Pp. 164-168.

Davidson, P.W, G.J. Myers, C. Cox (1998) Effects of prenatal and postnatal methylmercury exposure from fish consumption on neurodevelopment. JAMA 280:701-707.

Day (1991) Autopsy report. NJDEP.

De Jesus, I.M., de Oliveira Santos E.C., da Silva Brabo, E., Loureiro,E.C. de Magalhaes Camara, V., Mascarenhas, A.F., da Silva,D.F. and Cleary, D. (2001) Exposure to elemental mercury in urban workers and gold miners from the Tapajos Region, Para, Brazil. Bull. Environ. Contam. Toxicol. 67:317-323.

Delaware Estuary Program. 1996. Comprehensive Conservation and Management Plan.

Dietz, R., F. Riget, and E.W. Born (2000) Geographical differences of zinc, cadmium, mercury and selenium in Polar Bears (Ursus maritimus) from Greenland. Science Total Environ. 245:25-47.

Dooley, J.H. (1992) Natural sources of mercury in the Kirkwood-Cohansey Aquifer System of the New Jersey Coastal Plain, NJGS Report 27, 19 pp.

Draxler, A.F.J., P. Hauge and A.D. Deshpande (1991) Organic contaminants in hepatic tissues of lobster and flounder at the New York Bight "12-Mile" sewage sludge dumpsite : 1987-88 /: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Region, Northeast Fisheries Science Center Woods Hole, Mass.. 10 pp.

Duvall, S.E. and M.G. Barron (2000) A screening level probabilistic risk assessment of mercury in Florida Everglades food webs. Ecotoxicol. Environ. Safety 47:298-305.

Efroymson, R. A., M. Will and G. W. Suter II (1997) Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. U. S. Dept. of Energy. ES/ER/TM-126/R2.

Egeland, G.M. and J.P. Middaugh (1997) Balancing fish consumption benefits with mercury exposure, Science 278:1904-1905.

Eisenrich, S.J. & J. Reinfelder (2001) Interim Report to the NJDEP, The NJ Atmospheric Deposition Network (NJADN), Dept. of Environmehtal Sciences, Rutgers Univ., New Brunswick, NJ.

Eisler, R. (1987) Mercury Hazards to Fish, Wildlife and Invertebrates: A Synoptic Review. US Fish and Wildlife Service Biological Report. 85 (1.10), 90 pp.

Electric Power Research Institute (EPRI) (1994) Mercury Atmospheric Processes: A Synthesis Report; EPRI/TR-104214; Workshop Proceedings.

Elliott, J.E., R.J. Norstrom and G.E.J. Smith. (1996) Patterns, trends, and toxicological significance of chlorinated hydrocarbon and mercury contaminants in Bald Eagle eggs from the Pacific Coast of Canada. Arch. Environ. Contam. Toxicol. 31: 354-367.

EMCON (1998) Remedial Investigation Report, Troy Chemical Corporation, Inc., Newark, New Jersey.

Endo, T., S. Nakaya, R. Kimura and T. Murata (1986) Gastrointestinal absorption of inorganic mercuric compounds in vitro. Toxicol Appl Pharmacol. 83:187-196.

Engstrom, D.R. & E.B. Swain (1997) Recent declines in atmospheric mercury deposition in the Upper Midwest. Environ. Sci. Technol. 31:960-967.

ERM-Southeast, Inc. (1985) Berry's Creek Study, Volume 1, Nature of the Problem. Final Report. Task I of the Berrys Creek RI/FS Investigation.

Exponent Environmental Group (1998) Phase I Remedial Investigation Report: Ventron/Velsicol Site, Wood-Ridge/Carlsdadt, New Jersey (Draft), Volume 1 of 3. Prepared for Velsicol Chemical Corporation and Morton International, Inc.

Exponent Environmental Group and The Academy of Natural Sciences (1999a) Acid Brook Delta Ecological Investigation Phase I Report. Prepared for Du Pont Pompton lakes Works, Pompton Lakes, NJ.

Exponent Environmental Group (1999b) Acid Brook Delta Ecological Investigation, Phase 2 Report. Prepared for Du Pont Pompton Lakes Works, Pompton Lakes, New Jersey.

Faber, R.A., R.W. Risebrough and H.M. Pratt (1972) Organochlorines and mercury in Common Egrets and Great Blue Herons. Environ. Pollution 3:111-122.

Fiedler, N. I. Udasin, M. Gochfeld, G. Buckler, K. Kelly-McNeil, and H. Kipen (1999) Neuropsychological and stress evalaution fo a residential mercury exposure, Environ. Health Perspect. 107: 343-347.

Fields, T.W., T.F. McNevin, R.A. Harkov, & J.V. Hunter (1993) A summary of selected soil constituents and contaminants at background locations in New Jersey, NJDEP- Site Remediation Program and Vision of Science & Research, September, 43 pp.

Fields, T. (1999) Background levels of selected contaminants in New Jersey Soils. Site Remediation Program, NJDEP. Unpublished.

Fimreite, N., Fyfe, R.W. and Keith, J.A. (1970) Mercury contamination of Canadian prairie seed eaters and their avian predators. Canadian Field-Nat. 84:269-276.

Fimreite, N., W.N. Holsworth, J.A. Keith, P.A. Pearce, P.A. and I.M. Gruchy (1971) Mercury in fish and fish-eating birds near sites of industrial contamination in Canada. Canadian Field Nat. 85:211-220.

Fimreite, N. and L. Karstad (1971) Effects of dietary methyl mercury on Red-tailed Hawks. J. Wildlife Management, 35: 293-300.

Finley, M.T. and R.C. Stendell (1978) Survival and reproductive success of black ducks fed methylmercury. Environ. Pollut. 16:51-64.

Fitzgerald, W. F., Mason, R. P., and G.M. Vandal (1991) Atmospheric Cycling and Air-Water Exchange of Mercury over Mid-Continental Lacustrine Regions. Water, Air, and Soil Pollution 56: 745-767.

Fitzgerald, W. (1995) Is mercury increasing in the atmosphere? The need for an atmopheric mercury network (AMNET). Water, Air and Soil Pollution 80: 245-254.

Fitzgerald, W.F., C.H. Lamborg, A.W.H. Damman, J.M. Benoit & P. H. Balcom (1999) Contemporary and historical eolian depositional fluxes of mercury: archival records in ombrotrophic bogs and lake sediments from Nova Scotia and New Zealand. Mercury as a Global Pollutant - 5th International Conference. May 23-28, 1999. Rio de Janeiro, Brazil. Pg. 551.

Fitzgerald, W. F., Mason, R. P., and G.M. Vandal (1991) Atmospheric Cycling and Air-Water Exchange of Mercury over Mid-Continental Lacustrine Regions. Water, Air, and Soil Pollution 56: 745-767.

Frakes, R. A., S. L. Lemieux, and K. E. Clark. (1998) Reproductive success and egg contaminant concentrations of southern New Jersey peregrine falcons. U. S. Fish and Wildlife Service, NJ Field Office, Pleasantville, NJ and NJDEP Division of Fish and Wildlife, Trenton, NJ. 35pp+app.

Friedmann, A.S., M.C. Watzin, J.C. Leiter, and T. Brinck-Johnsen (1996) Effects of environmental mercury on gonadal function in Lake Champlain Northern Pike (*Esox lucius*) Bull. Environ. Contam. Toxicol. 56: 486-492.

Frithsen, J.B., D.E. Strebel, S. Schreiner, and T. Schawitsch (1995) Estimates of contaminant inputs to the Delaware Estuary. For the Delaware Estuary Program, U. S. Environmental Protection Agency, by versar, Incl., Columbia, MD. 162 pp. and appendix.

Gaines, K., C.G. Lord, C.S. Boring, I.L. Brisbin Jr., M. Gochfeld and J. Burger (2000) Raccoons as potential vectors of radionuclide contamiantion to humanf ood chains from a nuclear industrial site, J. Wildlife Managmenet 64:199-208.

Galae-Gorchev, H. (1993) Dietary intake in food and estimated intake of lead, cadmium, and mercury. Food Additives and Contaminants 10:115-128.

Galluzzi, P.F. (1976) Mercury concentrations is Muskrats, *Ondatra zibethiscus*, from the Hackensack Meadowlands, New Jersey, Master□s Thesis, Fairleigh Dickinson Univ., New Jersey.

Galluzzi, P.F. (1981) Mercury concentrations in mammals, reptiles, birds and waterfowl collected in the Hackensack Meadowlands, New Jersey. Presented at: The NJ Acaemy of Sciences, March 28.

Ganther, H.E., C. Goudie, M.L. Sunde, M.J. Kopecky, M.J., P.Wagner, P. S.H. Oh and W.G. Hoekstra (1972) Selenium: relation to decreased toxicity of methylmercury added to diets containing tuna. Science 175:1122-1124.

Ganther, H.E. (1980) Interactions of vitamin E and selenium with mercury and silver. Annals NY Acad Sci. 355:212-226.

Gerrard, P.M. and St Louis, V.L. (2001). The effects of experimental reservoir creation on the bioaccumulation of methylmercury and reproductive success of tree swallows (*Tachycineta bicolor*). Environ Sci Technol. 35:1329-1338.

Gerstenberger S.L., J. Pratt-Shelley, M.S. Beattie and J.A. Dellinger (1993) Mercury concentrations of Walleye (Stizostedion vitreum vitreum) in 34 northern Wisconsin lakes. Bull Environ Contam Toxicol 50:612-617.

Gilman, A.P., G.A. Fox, D.B. Peakall, S.M. Teeple, T.R. Carroll, and G.T. Haynes (1999) Reproductive parameters and egg contaminant levels of the Great Lakes Herring Gulls. J. Wildlife Management 41: 458-468.

Gilmour, C.C. & D.G. Capone (1987) Relationship between Hg methylation and the sulfur cycle in estuarine sediments. Ocean Sciences Abstr. Meet., EOS 68: 1718.

Gilmour, C.C. and G.S. Riedel (2000) A survey of size-specific mercury concentrations in game fish from Maryland fresh and estuarine waters. Arch. Environ. Contam. Toxicol. 39:53-59.

Gnamus, A., Byrne, A.R. and Horvat, M. (2000). Mercury in the soil-plant-deer-predator food chain of a temperate forest in Slovenia. Environ. Science Technol. 34:3337-3345.

Great Lakes Environmental Center (GLEC) (1996) Summary of the Phase I metals sampling and analysis program for the New Jersey component of the NY-NJ Harbor Estuary Program. Traverse City, MI 49686.

Gnamus, A., A.R. Byrne and M. Horvat (2000) Mercury in the soil-plant-deer-predator food chain of a temperate forest in Slovania, Environ. Sci. Technol. 34: 3337-3345.

Gochfeld, M. (1971) Pre-mature feather loss---a "new disease" of Common Terns on Long Island, New York. Kingbird 21:206-211.

Gochfeld, M. (1975) Developmental defects in Common Terns of western Long Island, New York. Auk 92:58-65.

Gochfeld, M. (1980) Tissue distribution of mercury in normal and abnormal young Common Terns. Marine Pollution Bull. 11:362-377.

Gochfeld, M. (1997) Spatial patterns in a bioindicator: heavy metal and selenium concentration in eggs of Herring Gulls (Larus argentatus) in the New York Bight. Arch. Environ. Contam.Toxicol 33:63-70.

Gochfeld, M. and J. Burger (1987a) Factors affecting tissue distribution of heavy metals: age effects and the metal concentration patterns in Common Terns, *Sterna hirundo.* Biol Trace Element Res 12: 389-399.

Gochfeld, M., and J. Burger (1987b) Heavy metal concentrations in the liver of three duck species: influence of species and sex. Environ. Pollution 45:1-15.

Gochfeld, M. and Burger, J. (1998) Temporal trends in metal levels in eggs of the endangered Roseate Tern (Sterna dougallii) in New York. Environ Research. 77A:36-42.

Gochfeld, M., J.L. Baland, T. Shukla, T. Benson, and J. Burger (1996) Heavy metals in Laughing Gulls: gender, age, and tissue differences. Environ. Toxixcol. Chem. 15:2275-2283.

Grandjean, P., P. Weihe, R.F. White, F. Debes, S. Araki, K. Yokoyama, K. Murata, N. Sorensen, R. Dahl and P.J. Jorgensen (1997) Cognitive deficit in 7-year old children with prenatal exposure to methylmercury. Neurotoxicol. Teratol. 19:417-428

Grieb T.M., C.T. Driscoll, S.P. Gloss, C.L. Schofield, G.L. Bowie and D.B. Porcella (1990) Factors affecting mercury accumulation in fish in the upper Michigan Peninsula. Environ Toxicol Chem 9:919-930.

Grier, J.W. (1974) Reproduction, organochlorines, and mercury in northwestern Ontario Bald Eagles. Canadian Field-Nat 88:469-475.

Haines T.A., V.T. Komov and C.H. Jagoe (1992) Lake acidity and mercury content of fish in Darwin National Reserve, Russia. Environ Pollut 78:107-112.

Haines T.A., V.T. Komov, V.E. Matey and C.H. Jagoe (1995) Perch mercury content is related to acidity and color of 26 Russian lakes. Water, Air, Soil Pollution 85:823-828.

Hall, R.A., E.G. Zook and G.M. Meaburn, G.M. (1978) National Marine Fisheries Service Survey of Trace Elements in the Fishery Resource. NOAA Technical Report NMFS SSRF-721. National Marine Fisheries Service, March 1978.

Hamilton, A. (1925) Industrial Poisons in the United States. Macmillan, New York.

Hammond, A.L. (1971) Mercury in the Environment: natural and human factors. Science 171:788-790.

Harada, M. (1995) Minamata Disease: Methylmercury Poisoning in Japan Caused by Environmental Pollution. Crit. Rev. Toxicol. 25:1-24.

Hays, H. and R.W. Risebrough (1971) The early warning of the terns. Natural History.

Hecky R.E., R.A. Bodaly, D.J. Ramsey, and N.E. Strange (1991) Increased methylmercury contamination in fish in newly formed freshwater reservoirs, pp. TO GET ORIGINAL. in Advances in Mercury Toxicology. (Clarkson TFW, Suzuki T, Imura A, eds) New York: Plenum.

Hochreiter, J.J., Jr. and J. Kozinski (1985) Quality of water and bed material in streams of Logan Township, Gloucester County, New Jersey, 1984. US Geological Survey Water Resources Investigations Report 85-4300.

Hoffman, R.D. and R.D. Curnow (1973) Toxic heavy metals in Lake Erie Herons. Proc. Conf. Great Lakes Research 16:50-53..

Huckabee J.W., J.W. Elwood and S.G. Hilderbrand (1979) Accumulation of mercury in freshwater biota pp. 277-301 et al. in The Biogeochemistry of Mercury in the Environment (Nriagu J.O., ed) Amsterdam: Elsevier/North Holland.

Hughes, K.D., P.J. Ewins and K.E. Clark (1997) A comparison of mercury levels in feathers and eggs of Osprey (Pandion haliaetus) in the North American Great Lakes. Arch. Environ. Contam. Toxicol. 33:441-452.

Hunter, D. (1974) The Diseases of Occupations. English Universities Press, Ltd, London.

Irwin, R.J., M. VanMouwerik, L. Stevens, M.D. Seese, and W. Basham (1997) Environmental Contaminants Encyclopedia, Mercury Entry, National Park Service, Water Resources Division, Fort Collins, Colorado.

Jackson, T.A. (1991) Biological and environmental control of mercury accumulation by fish in lakes and reservoirs of northern Manitoba, Canada. Can J Fish Aquatic Sci 48:2449-2470

Jacobs, H.L., H.D. Kahn, K.A. Stralka and D.B. Phan (1998) Estimates of per capita fish consumption in the US based on the Continuing Survey of Food Intake by Individuals (CSFII) Risk Analysis 18:283-291.

Jacobson, J.L. and S.W. Jacobson (1996) Intellectual impairment in children exposed to polychlorinated biphenyls in utero. New Engl. J. Med 335:783-789.

Jagoe C.H., P.L. Shaw-Allen, and B.S. Gill (1996) Na+-K+-ATPase activity in largemouth bass (Micropterus salmoides) from three reservoirs with different levels of mercury contamination. Aquatic Toxico. 36:161-176.

Johnston T.A., R.A. Bodaly and J.A. Mathias (1991) Predicting fish mercury levels from physical characteristics of boreal reservoirs. Can J Fish Aquatic Sci 48:1468-1475.

Jurczk, N.U. (1993) An ecological risk assessment of the impact of mercury ocntamiantion in the Florida Everglades. Master□s Thesis, Univ. Of Florida, Gainesville, FL.

Kabata-Pendias, A. and H. Pendias (1984) Trace Elements in Soils and Plants. CRC Press, Boca Raton FL.

Khan, B. and B. Tansel (2000) Mercury bioconcentrations factors in American Alligators (Alligator mississippiensis) in the Florida Everglades. Ecotoxicol. Environ. Safety 47:54-58.

Khan, A.T., and J.S. Weis. (1987) Effects of methylmercury on sperm and egg viability of two populations of killifish (Fundulus heteroclitus) Arch. Envir. Contam. Tox., 16:499-505.

Khan, A.T. and J.S. Weis (1993) Bioaccumulation of four heavy metals in two populations of mummichog, (*Fundulus heteroclitus*) Bull. Enviorn. Contam. Toxicol. 51:1-5.

Kinjo, Y., H. Higashi, A. Nakano, M. Sakamoto and R. Sakai (1993) Profile of Subjective Complaints and Activities of Daily Living Among Current Patients with Minamata Disease After 3 Decades. Environ. Res. 63-241-251.

Kjellstrøm, T., P. Kennedy, S. Wallis and C. Mantell (1986) Physical and Mental Development of Children with Prenatal Exposure Mercury from Fish. Stage 1: Preliminary Tests at Age 4. National Swedish Environmental Protection Board, Report 3080, Solna, Sweden.

Kjellstrøm, T., P. Kennedy, S. Wallis, A. Stewart, B. Lind, T. Wutherspoon and C. Mantell (1989) Physical and Mental Development of Children with Prenatal Exposure to Mercury from Fish. Stage 2: Interviews and Psychological Tests at Age 6. National Swedish Environmental Protection Board, Report 3642, Solna, Sweden.

Komsta-Szumska, E., K.R. Reuhl and D.R. Miller (1983) Effect of selenium on distribution, demethylation, and excretion of methylmercury by the guinea pig. J. Toxicol. Environ. Health.1:775-785.

Kosatsky, T. and P. Foran (1996) Do Historic Studies of Fish Consumers Support the Widely Accepted LOEL for Methylmercury in Adults. Neuro Toxicol. 17: 177-186.

Krabbenhoft, D.P. (1999) Summary Document for the USGS Workshop on Mercury Cycling in the Environment. Golden, CO, July 7-9, 1996. Website: http://toxics.usgs.gov/toxics/pubs/hg/summary.shtml.

Kurland, L.T., S.N. Faro and H. Siedler (1960) Minamata Disease. World. Neurology 1: 370-395.

Lacerda, L.D., E.D. Bidone, A.F. Guimaraes and W.C. Pfeiffer (1994) Mercury concentrations in fish from the Itacaiunas-Parauapebas River system, Carajas region, Amazon. An Acad Bras Cienc. 66:373-9.

Lambertini, M. (1982) Mercury levels in Larus audouinii and Larus michahellis breeding in Capraia Island (Tyrrhenian Sea) Rev. Ital. Ornit. 52:75-79.

Lange T, D. Richard, and H. Royals (2000) Long-term trends of mercury bioaccumulation in Florida's Largemouth Bass, Annual Meeting South Florida Mercury Science Program, Tarpon Springs FL.

Latif, M.A., R.A. Bodaly, T.A. Johnston and R.J. Fudge (2001) Effects of environmental and maternally derived methylmercury on the embryonic and larval stages of walleye (Stizostedion vitreum) Environ Pollut. 111:139-148.

Lawrence, A.L. and R.P. Mason (2001) Factors controlling the bioaccumulation of mercury and methylmercury by the estuarine amphipod Leptocheirus plumulosus. Environ Pollut. 111:217-231.

Lebel, J., D. Mergler, M. Lucotte, M. Amorim, J. Dolbec, D. Miranda, G. Arantès, I. Rheault and P. Pichet (1996) Evidence of Early Nervous System Dysfunction in Amazonian Populations Exposed to Low-Levels of Methylmercury. Neuro Toxicol. 17:157-168.

Lebel, J., D. Mergler, F. Branches, M. Lucotte, M. Amorim, F. Larribe and J. Dolbert (1998) Neurotoxic Effects of Low-level Methylmercury Contamination in the Amazonian Basin. Environ. Res. 79:20-32.

Leggett, R.W., N.B. Munro and K.F. Eckerman (2001) Proposed revision of the ICRP model for inhaled mercury vapor. Health Physics 81:450-455.

Lewis, S.A. and R.W. Furness (1991) Mercurya ccumulation and excretion by laboratory-reared black-headed gull *Larus ridibundus* chicks, Arch. Environ. Contam. Toxicol. 21: 316-320.

Lindberg, P. (1984) Mercury in feathers of Swedish Gyrfalcons, Falco rusticolus in relation to diet. Bul. Environ. Contam. Toxicol. 32:453-459.

Lindberg, P. and T. Odsjö (1983) Mercury levels in feathers of Peregrine Falcon Falco peregrinus compared with total mercury content in some of its prey species in Sweden. Environ. Pollut. 5: 297-318.

Lipsky, D., R.J. Reed, and R. Harkov (1980) Mercury Levels in Berry's Creek. Office of Cancer and Toxic Substances Research. NJDEP. 76 pp.

Lockhart, W.L., J.F. Uthe, A.R. Kenney and P.M. Mehrle (1972) Methylmercury in Northern Pike (*Esox lucius*): distribution, elimination and some biochemical characteristics of contaminated fish. J. Fish. Res. Board Can., 29: 1519-1523.

Lockhart, W.L., R.W. Macdonald, P.M. Outridge, P. Wilkinson, J.B. Delarond, & J.W.M. Rudd (1999) Tests of the fidelity of lake sediment core records of mercury deposition to known historics of mercury contamination. Mercury as a Global Pollutant - 5th International conference. May 23-28, Rio de Janeiro, Brazil.

Lofroth, G. (1970) Methyl Mercury: A review of the health hazards and side effects associated with the emission of mercury compounds into natural systems. Ecological Research Committee Bulletin No. 4, (2nd ed.) Swedish Natural Science Research Council, Stockholm, Sweden.

Malm, O., F.J. Branches, H. Akagi, M.B. Castro, W.C. Pfeiffer, M. Harada, W.R. Bastos and H. Kato (1995) Mercury and methylmercury in fish and human hair from the Tapajos River basin, Brazil. Science Total Environ. 175:141-150.

Marien, K. and G.M. Patrick (2001) Exposure analysis of five fish-consuming populations for overexposure to methylmercury. J. Exposure Anal. Environ. Epidemiol. 11:193-206.

Marsh, DO., M.D. Turner, J.C. Smith, P. Allen and N. Richdale (1995) Fetal methylmercury study in a Peruvian fish-eating population. Neurotoxicology 16:717-726.

Martin-Doimeadios, R.C., Wasserman, J.C., Bermejo, L.F., Amouroux, D., Nevado ,J.J., and Donard, O.F. (2000) Chemical availability of mercury in stream sediments from the Almaden area, Spain. J Environ Monit.2:360-366.

Mason, R.P., W.F. Fitzgerald and F.M.M. Morel (1994) The biogeochemical cycling of elemental mercury: anthropogenic influences. Geochim. Cosmochim. Acta 58/15: 3191-3198.

Matsunaga, T., T. Ueno, R.L.R. Chandradjith, H. Amano, M. Okunura & H. Hashitani (1999) Cesium-137 and mercury contamination in lake sediments. Chemosphere. 39 (2): 269-283.

May, H. And J. Burger (1996) Fishing in a poluted estuary: fishing behavior, fish consumption and potential risk, Risk Analysis 16:459-471.

McFarlane G.A. and W.G. Franzin (1980) An examination of Cd, Cu, and Hg concentrations in livers of northern pike Esox lucius, and white sucker, Catastomus commersoni, from five lakes near a base metal smelter at Flin Flon, Manitoba. Can J Fish Aquatic Sci 37:1573-1578.

McKim, J.M., G.F. Olson, G.W. Holcombe, and E.P. Hunt (1976) Long-term effects of methylmercuric chloride on three generations of brook trout (Salvelinus fontinalis): Toxicity, accumulation, distribution, and elimination. J. Fish. Res. Board Can. 33: 2726-2739.

McLaughlin, M. and R. Hamon (2001). Perspectives on inputs of cadmium to the food chain, pp. 60-65, in Syers, K and M. Gochfeld (eds). Environmental Cadmium in the Food Chain: Sources, Pathways, and Risks. Proceedings of SCOPE Workshop, Belgian Academy of Sciences, September 2000.

Meili, M. (1995) Pre-industrial atmospheric deposition of mercury: uncertain rates from lake sediment and peat cores. 1995. Water, Air, and Soil Pollution 80 (104): p. 637-640.

Miller D.R. and H. Akagi (1979) pH affects mercury distribution, not methylation. Ecotoxicol Environ Safety 3:36-38.

Minnesota Pollution Control Agency (1998) Options and Strategies for Reducing Mercury Releases, Source Reduction Feasibility and Reduction Strategies Committee Report, Minnesota Pollution Control Agency, Policy and Planning Division, Majors Air Unit, 520 Lafayette Rd., St. Paul, MN.

Monmouth County (NJ) Board of Health (1989) Interim report on the nine coastal lakes in Monmouth County.

Murphy, E.A., & M. Aucott (1999) A methodology to assess the amounts of pesticidal mercury used historically in New Jersey, Journal of Soil Contamination 8(1): 131-148.

Murphy, E.A., J. Dooley, H.L. Windom and R.G. Smith Jr. (1994) Mercury species in potable groundwater in southern New Jersey. Water, Air, and Soil Pollution 78: 61-72.

National Atmospheric Deposition Program (NADP) (2000) 1999 Annual Summary, NADP Data Report 2000-02, NADP Program Office, Illinois State Water Survey, Champaign, IL.

National Center for Health Statistics (NCHS) (2001) National Health and Nutrition Examination Survey (NHANES IV), U.S. Public Health Service, Hyattsville, Maryland.

National Center for Health Statistics (NCHS) (1978) National Health and Nutrition Examination Survey (NHANES I), Selected Findings: Food consumption profiles of white and black persons 1-74 years of age in the U.S., 1971-74, Pata 21:1-11.

National Institute of Environmental Health Sciences (NIEHS) (1998) Report on the Workshop on Scientific issues relevant to assessment of health effects from exposure to methylmercury, Brownestone Hotel, Raleigh, NC, Nov. 18-20.

National Research Council (NRC) (2000) Toxicological Effects of Methylmercury. National Academy Press, Washington, D.C.

National Oceanic and Atmospheric Administration (NOAA) (1998) Raw data file. NOAA National Status and Trends Program.

National Oceanic and Atmospheric Administration (NOAA) (1999) Data Base for Newark Bay. Prepared by Hazardous Materials Response and Assessment Division.

National Wildlife Federation (1999) Clean the Rain, Clean the Lakes: Mercury in Rain is Polluting the Great Lakes. National Wildlife Federation Ann Arbor, MI, http://www.nwf.org/greatlakes

National Institute of Environmental Health Sciences (NIEHS) (1998) Scientific Issues Relevant to Assessment of Health Effects from Exposure to Methylmercury. Report of the November 18-20, 1998 Workshop, Raleigh, NC.

NESCAUM, NEWMOA, NEIWPCC and EMAN (1998) Northeast States and Eastern Canadian Provinces Mercury Study: A Framework for Action. Northeast States for Coordinated Air Use Management, Boston, MA.

New Jersey Department of Environmental Protection and Energy (NJDEPE) (1993) Task Force on Mercury Emissions Standard Setting. Final Report on Municipal Solid Waste Incineration. Vol. II: Environmental and Health Issues. July 1993.

New Jersey Department of Environmental Protection (NJDEP) (1995a) A guide to health advisories for eating fish and crabs caught in NJ waters, 4 pp, Division of Science, Research and Technology, Trenton, NJ, 4 pp.

New Jersey Department of Environmental Protection (NJDEP) (1995b) NJ household fish consumption study, Conducted by the Center for Public Interest Poling, Eagleton Institute of Politics, Rutgers Univ. And the NJ Marine Sciences Consortium. Final Report, Trenton, NJ.

New Jersey Department of Environmental Protection (NJDEP) (1998a) Environmental Indicators Technical Report, National Environmental Performance Partnership System (NEPPS).

New Jersey Department of Environmental Protection (NJDEP) (1998b) Guidance for Sediment Quality Evaluations. Site Remediation Program, NJDEP, 28 pp.

New Jersey Department of Environmental Protection (NJDEP) (1996) The Delaware Estuary Program, Comprehensive Conservation and Management Plan. USEPA Region III. Philadelphia, PA. Versar, Inc. 1994. Estimates of contaminant inputs to the Delaware River from nonpoint sources. Contract draft report to the Delaware Estuary Program.

New Jersey Department of Environmental Protection (NJDEP) (1999) Toxics Source Reduction Plan for the NY-NJ Harbor Estuary. Office of Program Coordination. New York-New Jersey Harbor Estuary Program Including the Bight Restoration Plan. 1996. Final Comprehensive Conservation and Management Plan. US Environmental Protection Agency.

New Jersey Department of Environmental Protection (NJDEP), Div. Fish and Wildlife (2000) New Jersey fish and wildlife digest. Vol.13-.2: 24-25pp.

New Jersey Department of Health and Senior Services (NJDHSS) and NJDEP (1997) A guide to eating fish and seafood; what you should know if you are: pregnant, planing to be pregnant or have a young child, Trenton, NJ, 7 pp.

New York State Department of Environmental Conservation (NYSDEC) (1981) Autopsy report on American Kestrel. Unpublished document.

New York-New Jersey Harbor Estuary Program including the New York Bight Restoration Plan (1996) Comprehensive Conservation and Management Plan. USEPA Region II, New York, NY.

Newland, M.C. and E.M. Paletz (2000) Animal studies of methylmercury and PCBs: what do they tell us about expected effects in humans. NeuroToxicology 21:1003-1028.

Newland, M.C. and E.B. Rasmussen (2000) Aging unmasks adverse effects of gestational exposure to methylmercury in rats. Neurotoxicol Teratol. 22:819-28.

Nichols J, S. Bradbury and J. Swartout (1999) Derivation of wildlife values for mercury. J Toxicol Environ Health B Crit Rev. 2:325-355.

Nierenberg, D.W., R.E. Nordgren, M.B. Chang, R.W. Siegler, M.B. Blayney, F. Hochberg, T.Y. Toribara, E. Cernichiari and T. Clarkson (1998) Delayed cerebellar disease and death after accidental exposure to dimethylmercury. New Engl. J. Med. 338: 1672-1676.

Niimi, A.J., and G.P. Kissoon (1994) Evaluation of the critical body burden concept based on inorganic and organic mercury toxicity to Rainbow Trout (*Oncorhynchus mykiss*) Arch. Environ. Contam. Toxicol. 26: 169-178.

Niimi, A.J. and L. Lowe-Jinde (1984) Differential blood cell r atios of Rainbow *Trout (Aslmo gairdneri*) exposed to methylmercury and chlrobenzenes, /arcg, /ebvuirb, /cibtan, /tixucik, 13L 393-311.

Nriagu, J.O. (1979) The biogeochemistry of mercury in the environment/editor, J.O. Nriagu. Publication info: Amsterdam, New York, Elsevier/North-Holland Biomedical Press.

Nriagu, J.O. (1989) A global assessment of natural sources of atmospheric trace metals. Nature 338:47-49

Odsjö, T. 1975. Toxic chemicals in sedentary and migratory birds in Fennoscandia and the Baltic area. Ornis Fenn. 52:74-82.

Olsen, S.F., J. Olsen and Frische, G. (1990) Does fish consumption during pregnancy increase fetal growth? Internatl J. Epidemiology 19: 971-977.

Orloff, K.G., G. Ulirsch, L. Wildes, A. Block, J. Fagliano, & J. Pasqualo Jr. (1997) Human exposure to elemental mercury in a contaminated residential building, Arch. Environ. Health 52:169-172.

Pai, P., P. Karamachandani and C. Seigneur (1997) Simulation of the Regional Atmospheric Transport and Fate of Mercury Using a Comprehensive Eulerian Model. Atmospheric Environment 31: 2707-2732.

Park J-G and L.R. Curtis (1997) Mercury distribution in sediments and bioaccumulation by fish in two Oregon Reservoirs: point-source and nonpoint-source impacted systems.

Peakall, D.B. and R.J. Lovett. (1972) Mercury: its occurrence and effects in the ecosystem. BioScience 22(1):20-25.

Perry, D. M., J. S. Weis and P. Weis (1988) Cytogenetic effects of methylmercury on embryos of the killifish, Fundulus heteroclitus. Arch. Envir. Contam. Tox., 17:569-574.

Pfeiffer, W.C., L.D. de Lacerda, O. Malm, C.M. Souza, E.G. da Silveira and W.R. Bastos (1989) Mercury concentrations in inland waters of gold mining areas in Rondonia, Brazil. Science Total Environ. 87-88:233-240.

Pflugh, K.K., L. Lurig, L.A. von Hagen, S. Von Hagen and J. Burger (1999) Urban anglers' perception of risk from contaminated fish, Sci. Tot. Environ. 228:203-218.

Pillay, K.K.S., C.C. Thomas Jr., J.A. Sondel and C.M. Hyche CM (1972) Mercury pollution of Lake Erie ecosphere, Environ. Res. 5:172-181.

Prestbo, E.M. and N.S. Bloom (1994) Mercury Speciation Adsorption (MESA) Method Intercomparison Results in Combustion Flue Gas. In: Proceedings of the Eleventh Annual International Pittsburgh Coal Conference: Coal-Energy and the Environment, Volume 1. The University of Pittsburgh School of Engineering Center for Energy Research, September 12-16, 1994, pp. 557-562.

Price, P.S; Su, S.H, Gray, M.N. (1994) The effect of sampling bias on estimates of angler consumption rates in creel surveys. J. Exposure Anal. Environ. Epidemiol. 4:355-372.

PTI (1997) Alternative Risk-Based Residential Cleanup Level for Mercury in Hawthorne Site Soil. Vol. 1 - Technical Report. Prepared for Merck & Co. Inc., Somerset, NJ. PTI Environmental Services, Bellevue, WA., March 1997.

Ramazzini, B. 1713. De Morbis Artificum Diatriba. Translation by W.C. Wright. Univ. Chicago Press, Chicago.

Ramprashad, F. and K. Ronald. (1977) A surface preparation study on the effect of methylmercury on the sensory hair cell population in the cochlea of the Harp Seal (Pagophilus groenlandicus Erxleben, 1977) Canad. J. Zool. 55: 223-230.

Rappe, A. (1973) Influence de la pollution par le mercure sur les populations d'oiseaux. L'Oiseau et R.F.O. 43: 196-204.

Redmayne, A.C., Kim, J.P., Closs, G.P. and Hunter, K.A. (2000) Methyl mercury bioaccumulation in Long-finned Eels *Anguilla dieffenbachia,* from three rivers in Otago, New Zealand. Sci. Total Environ. 262:37-47.

Reid, R.N., J.E. O'Reilly & V.S. Zdanowicz (1982) Contaminants in New York Bight and Long Island Sound sediments and demersal species, and contaminant effects on benthos, summer 1980: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Center,Woods Hole, Mass., 96 pp.

Ribeyre, F. and A. Bouduo (1994) Experimental study of inorganic and methylmercury bioaccumulation by four species of freshwater rooted macrophytes from water and sediment contamination sources. Ecotoxicol Environ Saf. 28:270-286.

Rice, D.C. (1995) Neurotoxicity of lead, methylmercury, and PCB's in relation to the Great Lakes, Environmehtal Health Persepctive 103(supplement 9): 71-81.

Rice, D.C. (2000) Identification of functional domains affected by developmental exposure to methylmercury: Faroe Islands and related studies, Neuro. Toxicol. 21:1039-1044.

Riley, D.M., C.A. Newlov, T.O. Leal-Almerz & V.M. Thomas (2001) Assessing elemental mercury vapor exposure from cultural and religious practices, Environ. Health Perspect. 109:779-784.

Rissanen T., S. Voutilainen, K. Nyyssonen, T.A. Lakka and J. Salonen (2000) Fish oil-derived fatty acids, docosahexaenoic acid and docosapentaenoic acid , and the risk of acute coronary events: the Kuopio ischaemic heard disease risk factor study. Circulation 102:2677-2679.

Roberts, M. R. and K. E. Clark. (1995) Evaluation of contaminant residues in Delaware Bay bald eagle nestlings. Report by USFWS, NJ Field Office (Pleasantville) and NJDEP, Division of Fish, Game and Wildlife (Tuckahoe).

Rompala, J.M., F.W. Rutosky, and D.J. Putnam (1984) Concentrations of environmehtal contaminants from selected waters in Pennsylvania. US Fish and Wildlife Services Report, State College, PA.

Ronald, K, S.V. Tessaro, J.F. Uthe, H.C. Freeman, and R. Frank. (1977) Methylmercury poisoning in the Harp Seal (Pagophilus groenlandicus) Sci. Total Environ. 8: 1-11.

Rupp, E.M., Miller, F.L., and Baes, C.F. (1980) Some results of recent surveys of fish and shellfish consumption by age and region of U.S, residents. Health Physics 39:169-175.

Salonen J.T, Seppanen K, Nyyssonen K, Korpela H, Kauhanen J, Kantola M, Tuomilehto J, Esterbauer H, Tatzber F, and Salonen R (1995) Intake of mercury from fish, lipid peroxidation, and the risk of myocardial infarction and coronary cardiovascular, and any death in eastern Finnish men. Circulation 1; 9: 645-55.

Santoro, E.D., and S.J. Koepp (1986) Mercury levels in organisms in proximity to an old chemical site (Berrys Creek, Hackensack Meadowlands, New Jersey, USA) Mar. Poll. Bull. 17(5): 219-224.

Schantz, S.L. (1996) Developmental neurotoxicity of PCBs in humans: what do we know and where do we go from here. Neurotox and Teratol. 18217-227, 1996.

Scheuhammer, A.M. 1991. Effects of acidification on the availability of toxic metals and calcium to wild birds and mammals. Environ. Pollut. 71: 329-375.

Schuler, C.A., R.G. Anthony and H.M. Ohlendorf (1990) Selenium in wetlands and waterfowl foods at Kesterson Reservoir, California, 1984. Arch. Environ. Contam. Toxicol. 19:854-853.

Seigneur, C., K. Lohman, P. Pai, K. Heim, D. Mitchell and L. Levin (1999) Uncertainty Analysis of Regional Mercury Exposure. Water, Air and Soil Pollution 112:151-162.

Shephard, B.K. (1998) Quantification of ecological risks to aquatic biota from bioaccumulated chemicals. Pp. 2-31 to 2-52, IN: National Sediment Bioaccumulation Conference Proceedings. September 11-13, 1996, Bethesda, Maryland. USEPA 823-R-98-002, Office of Water.

Simon, O. and A. Boudou (2001a) Direct and Trophic Contamination of the Herbivorous Carp Ctenopharyngodon idella by Inorganic Mercury and Methylmercury. Ecotoxicol Environ Safety. 50:48-59.

Simon, O. and A. Boudou (2001b) Simultaneous experimental study of direct and direct plus trophic contamination of the crayfish Astacus astacus by inorganic mercury and methylmercury. Environ Toxicol Chem. 20:1206-1215.

Sites, A. (1994) Removing mercury using POET systems. Water Conditioning and Purification, October 1994: 94-99.

Sjoblom, A., Meili, M., and Sundbom, M. (2000) The influence of humic substances on the speciation and bioavailability of dissolved mercury and methylmercury, measured as uptake by Chaoborus larvae and loss by volatilization. Science Total Environ. 261:115-124.

Smith, J.C., P.V. Allen and R. Von Burg (1997) Hair methylmercury levels in US women, Arch. Env. Health 52:476-580.

Smith, H.M. and E.D. Brodie, Jr. (1982) A Guide to Field Identification, Reptiles of North America. Golden Press, New York, 240 pages.

Smith, G.M., A.T. Khan, J.S. Weis and P. Weis. (1995) Behavior and brain chemistry correlates in nummichogs (*Fundulus heteroclitus*) from polluted and unpolluted environments. Mar. Environ. Res. 39: 329-333.

Smith, G.M., and J.S. Weis (1997) Predator-prey relationships in mummichogs (Fundulus heteroclitus (L.): effects of living in a polluted environment. J Exper Marine Biol Ecol. 209:75-87.

Snarski, V.M. and G.F. Olson. (1982) Chronic toxicity and bioaccumulation of mercuric chloride in the Fathead Minnow (Pimephales promelas) Aquat. Toxicol. 2: 143-156.

Snodgrass, J.W., Jagoe, C.H., Bryan, L., Brant, H.A. and Burger, J. (2000) Effects of trophic status and wetland morphology, hydroperiod and water chemistry on mercury concentration in fish. Canad. J. Fisher. Aquatic Sci. 57:171-180.

Snyder, N.F.R., Snyder, H.A., Lincer, J.L. and Reynolds, R.T. (1973) Organochlorines, heavy metals, and the biology of North American Accipiters. BioScience, 23: 300-305.

Solonen, T. And M. Lodenius (1990) Feathers of birds of prey as indicators of mercury contamination in southern Finalnd, Holarct Ecol. 13: 229-237.

Solonin and Lodenius. (1984)

Southworth, G.R., M.J. Peterson and M.G. Ryon (2000) Long-term increased bioaccumulation of mercury in Largemouth Bass follows reduction of waterborne selenium, Chemosphere 41:1101-1105.

Spalding, M.G., P.C. Frederick, H.C. McGill, S.N. Bouton and L.R. McDowell (2000a) Methylmercury accumulation in tissues and its effects on growth and appetite in captive Great Egrets, J. Wildlife Diseases 36:411-422.

Spalding, M.G., P.C. Frederick, H.C. McGill, S.N. Bouton, L.J. Richey, I.M. Schumacher, C.G.M. Blackmore and J. Harrison (2000b) Histologic, neurologic, and immunologic effects of methylmercury in captive Great Egrets, J. Wildlife Diseases 36:423-435.

Spronk, N. and G.C. Hartog. (1970) Mercury in birds of prey. Ardea 59:34-37.

Spry, D.J. and J.G. Wiener (1991) Metal bioavailability and toxicity to fish in low-alkalinity lakes: a critical review, Environ. Pollut. 71: 243-304.

Steidl, R. J., C. R. Griffin, and L. J. Niles. (1991) Contaminant levels in osprey eggs and prey reflect regional differences in reproductive success. J. Wildl. Manage. 55(4): 601-608.

Stern, A.H., (1997a) A Review of Merck Submission on Bioavailability of Mercury Contamination at Hawthorne Site " NJDEP Memo from Alan Stern to Barry Frasco, July 28.

Stern, A.H. (1997b) An Estimate of Hg Inhalation Exposure Potential." Memo from Alan Stern to Eileen Murphy. Division of Science and Research, NJDEP, October 15, 1997.

Stern, A.H., M. Gochfeld, C. Weisel and J. Burger (2001) Mercury and methylmercury exposure in the NJ pregnant population, Arch. Environ. Health., in press.

Stern, A.H., Korn, L.R., and Ruppel, B.E. (1996) Estimation of fish consumption and methylmercury intake in the New Jersey population. J. Exposure Analysis Env. Epidemiology 6:503-527.

Stevenson, E., R. England, & B. Ruppel (1995) A pilot study to assess trace levels of mercury in New Jersey lakes and precipitation, NJDEP-DSR Research Project Report, August 1995, 22 pp.

Stoewsand, G.S., C.A. Bache and D.J. Lisk (1974) Dietary selenium protection of methylmercury intoxication of Japaneses quail, Bull. Environ. Contam. Toxicol 11(2):152-156.

Styrishave, B. And M.H. Depledge (1996) Evaluation of mercury-inducted changes in circadian heart rate rhythms in the freshwater crab, *Potamon potarnios*, and the crayfish, *Astacus astacus*, as an early predictor of mortality, Comparative Biochemistry and Physiology A-Physiology 115(4):349-356.

Sutton, C.C., J.C. O'Herron, II, and R. T. Zappalorti (1996) The scientific characterization of the Delaware Estuary. A publication of the Delaware Estuary Program.

Sweet, C., E. Prestbo, and B. Brunette (1999) Wet deposition of mercury in the US and Canada, presented at "Mercury in the Environment Specialty Conference," September 15-17, 1999, Minneapolis, MN, Proceedings published by Air and Waste Mgmt. Assoc., Pittsburgh, PA.

Tejning, S. (1967) Biological effects of methyl mercury dicyandiamide treated grain in the domestic fowl Gallus gallus L. Oikos 1967 Suppl. 8:1-116.

Thompson D.R., R.W. Furness and R.T. Barrett (1992) Mercury concentrations in seabirds from colonies in the northeast Atlantic, Arch Environ Contam Toxicol.23:383-389.

Thompson, D.R. and R.W. Furness (1989) Comparison of the levels of total and organic mercury in seabird feathers, Marine Pollution Bull. 20:577-579.

Thompson, D.R., R.W. Furness and L.R. Monteiro (1998) Seabirds as biomonitors of mercury inputs to epipelagic and mesopelagic marine food chains. Science Total Environ. 213:299-305.

Toxics in Biota Committee (1994) Mercury Contamination in New Jersey Freshwater Fish - Report of the Toxics in Biota Committee. New Jersey Department of Environmental Protection, New Jersey Department of Health, New Jersey Department of Agriculture. July 1994.

United States Geological Survey (USGS) (1997) Mercury in Ground Water, Soils, and Sediments of the Kirkwood-Cohansey Aquifer System in the New Jersey Coastal Plain. Open-File Report 95-475. US Geological Survey, West Trenton, NJ.

US Department of Energy (USDOE) (1994) National Environmental Research Parks. Washington, DC.

US Fish and Wildlife Service (USFWS) 1990. Concentrations of organochlorines and trace elements in fish andBlue Crabs from the Delaware River. Easton to Deepwater. Pennsylvania Field Office, Rept. N. 90:5-05. United States Fish and Wildlife Service, 19 pp.

US Food and Drug Administration (USFDA) (1994) FDA Consumer Report, Consumpiton advice on eating shark and swordfish.

US Environmental Protection Agency (USEPA) 1991. ECOTOX: Ecological Database. Office of Research and Development.

US Environmental Protection Agency (USEPA) (1992) National Study of Chemical Residues in Fish vols. I and II. Report # 823-R-92-008 Washington DC: US Environmental Protection Agency.

US Environmental Protection Agency (USEPA) (1992a) Guidelines for Exposure Assessment. USEPA/600Z-92/001. FR 57: 22888 - 22938

US Environmental Protection Agency (USEPA) (1992b) Characerization of products containing mercury in municipal solid wastes in the US, 1970 to 2000, USEPA 530-R-92-013, USEPA, Office of Solid Waste and Emergency Response.

US Environmental Protection Agency (USEPA) (1993) National Fish Tissue Data Repository, USEPA, Washington, DC.

US Environmental Protection Agency (USEPA) (1995a) Method 669. Sampling ambient water for trace metals at EPA water quality criteria levels. USEPA. 821-R-95034.

US Environmental Protection Agency (USEPA) (1995b) The use of the benchmark dose approach in health risk assessment. Office of Research and Development, Washington, DC: USEPA/630/R-94/007, February, 1995

US Environmental Protection Agency (USEPA) (1998) An SAB Report: Review of the USEPA Draft Mercury Study Report to Congress. USEPA-SAB-EC-98-001. October 1997.

US Environmental Protection Agency (USEPA) (1997c) Mercury Study Report to Congress. Vol. 3: Fate and Transport of Mercury in the Environment, USEPA-452/R-97-003. US Environmental Protection Agency, Washington, DC.

US Environmental Protection Agency (USEPA) (1997b) Mercury Study Report to Congress. Vol. 4: An Assessment of Exposure to Mercury in the United States. USEPA-452/R-97-006.

US Environmental Protection Agency (USEPA) (1997c) Mercury Study Report to Congress, Vol. 5: Health Effects of Mercury and Mercury Compounds. USEPA-452/R-97-007.

US Environmental Protection Agency (USEPA) (1997e) Mercury Study Report to Congress, Vol. 7: Characterization of Human Health and Wildlife Risks from Mercury Exposure in the United States. USEPA-452/R-97-009.

US Environmental Protection Agency (USEPA) (1999b) National Recommended Water Quality Criteria. USEPA 822-Z-99-001. Office of Water.

US Environmental Protection Agency (USEPA) 1999c. Passaic River Study Area. Fact sheet. Web page: ww.epa.gov/region02/superfnd/pass-ou2.htm.

US Environmental Protection Agency (USEPA) (2000) Workshop on Source Emission and Ambient Air Monitoring of Mercury: Bloomington, MN September 13-14, 1999. USEPA/625/R-00/002) June 2000.

US Environmental Protection Agency (USEPA (2001) Water quality criterion for protection of human health: Methylmercury - Final. USEPA-823-R-01-001.

United States Food and Drug Administration (USFDA) (1992) Compilation of Methylmercury Results by Species for FY91 and FY92. Office of Seafood. Washington, D.C.

Vahter M, A. Akesson, B. Lind, U. Bjors, A. Schutz and M. Bergluund (2000) Longitudinal study of methylmercury and inorganic mercury in blood and urine of pregnant and lactating women, as well as in umbilical cord blood. Environ. Research 84:186-194.

Van Metre P.C. & E. Callendar (1997) Study plan for the reconstructed trends project of the National Water Quality Assessment Program. Website: http://tx.usgs.gov/coring/approach.html United States Geological Survey. 1999. National Water Quality Assessment Program.

Varanasi, U., J.E. Stein, K.L. Tilbury, J.P. Meador, C.A. Sloan, D.W. Brown, J. Calambokidis, and S. Chan. (1993) Chemical contaminants in Gray Whale (Eschrichtius robustus) stranded in Alaska, Washington, and California, USA. NOAA Technical Memorandum NMFS-NWFSC-11, 115 p.

Vermeer, K., F.A.J. Armstrong and D.R.M. Hatch (1973) Mercury in aquatic birds at Clay Lake, western Ontario. J. Wildlife Manage. 37:58-61.

Versar, Inc. (1994) Estimates of contaminant inputs to the Delaware Estuary from nonpoint sources. Contract report to the Delaware Estuary Program.

Verta M. (1990) Changes in fish mercury concentrations in an intensively fished lake. Can J Fish Aquatic Sci 47:1888-1897.

Wagemann, R. and D.C.G. Muir. (1984) Concentration of heavy metals and organochlorines in marine mammals of northern waters: overview and evaluation. Canadian Technical Report of Fisheries and Aquatic Sciences 1279.

Wang, A., Barber, D., and Pfeiffer, C.J. (2001) Protective effects of selenium against mercury toxicity in cultured Atlantic Spotted Dolphin (Stenella plagiodon) renal cells. Arch. Environ. Contam. Toxicol. 41:403-409.

Weihe, P., P. Grandjean, F. Debes, and R. White (1996) Health implication for Faroe Islanders of heavy metals and PCBs from Pilot Whales. Science Total Environ. 186:141-148.

Wiener, J.G. (1996) Mercury in fish and aquatic food webs. Paper presetned at US Geological Survey meeting, "Merucyr Cycling in the Environment," USGS, Office of Water Quality, Denver, CO.

Weis, J.S. and A.A. Khan (1990) Effects of mercury on the feeding behavior of the Mummichog, Fundulus heterolcitus, from a polluted habitat. Marine Environ Research 30:243-249.

Weis, J.S., and A.A. Khan (1991) Reduction in prey capture ability and condition in mummichogs from a polluted habitat. Trans. AM. Fish. Soc. 120: 127-129.

Weis, J. S. and P. Weis. (1977a) Effects of heavy metals on development of the killifish, Fundulus heteroclitus. J. Fish Biology, 11:49-54.

Weis, P. and J. S. Weis. (1977b) Methylmercury teratogenesis in the killifish, Fundulus heteroclitus. Teratology, 16:317-326.

Weis, J.S. and P. Weis (1989) Tolerance and stress in a polluted environment: the case of the Mummichog. BioScience 39:89-95.

Weis, J.S. and P. Weis (1995a) Swimming performance and predator avoidance by mummichog (Fundulus heteroclitus) larvae after embryonic or larval exposure to methylmercury. Can J Fish Aquatic science 52: 2168-2173.

Weis, J.S. and P. Weis (1995b) Effects of embryonic exposure to methylmercury on larval prey-capture ability in the Mummichog, Fundulus heteroclitus. Environ Toxicol Chemistry 14:153-156, 1995b.

Weis, J. S., P. Weis, and J.L. Ricci. (1981) Effects of cadmium, zinc, salinity, and temperature on the teratogenicity of methylmercury to the killifish (Fundulus heteroclitus) Rapp. P.-v. Réun. Cons. int. Explor. Mer, 178:64-70.

Wester, P.W. (1991) Histopathological effects of environmental pollutants B-HCH and methylmercury on reproductive organs in freshwater fish. Comp. Biochem. Physiol. 100C: 237-239.

Wiemeyer, S.N., D.M. Bunck, and C.J. Stafford (1993) Environmental contaminants in Bald Eagle eggs - 1980-1984 - and further interpretations of relationships to productivity and shell thickness. Arch. Environ. Contam. Toxicol. 24:213-227.

Wiemeyer, N., R.M. Jurek, and J.F. Moore (1986) Environmental contaminants in surrogates, foods and feathers of California Condors (Gymnogyps californianus) Environ. Monitor. Assess. 6:91-111.

Wiemeyer, S.N., T.G. Lamont, C.M. Bunck, C.R. Sindelar, F.J. Gramlich, J.D. Fraser and M.A. Byrd. (1984) Organochlorine pesticide, polychlorobiphenyl, and mercury residues in Bald Eagle eggs - 1969-1979 - and their relationship to shell thinning and reproduction. Arch. Environ. Contam. Toxicol. 13:529-549.

Wiener, J.G., W.F. Fitzgerald, C.J. Watras and R.G. Rada (1990) Partitioning and bioavailability of mercury in an experimentally acidified lake, Enviorn. Toxicol. Chem. 9:909-918.

Windom, H.L and D.R. Kendall (1979) Accumulation and biotransformation of mercury in coastal and marine biota pp. 303-324. in Nriagu, J.O. (ed) The Biogeochemistry of Mercury in the Environment. Elsevier-North Holland Press, Amsterdam.

Windom, H.L. & R.G. Smith, Jr. (1992) Analysis of mercury species in ground water using inductively coupled plasma - mass spectrometry and gas chromatography, Final Report to NJDEP, September, 30 pp.

Wobeser, G. (1975) Prolonged oral administration of methylmercury chloride to Rainbow Trout (*Salmo giardneri*) J. Fish. Res. Board Can. 32: 2015-2023.

World Health Organization (WHO) (1990) Environmental Health Criteria; 101, Methylmercury. Geneva, Switzerland.

World Health Organization (WHO) (1991) Inorganic Mercury. Environmental Health Criteria 118. Geneva.

Yanochko, G.M., Jagoe, C.H. and Brisbin, I.L. Jr. (1997) Tissue mercury concentrations in Alligators (*Alligator mississippiensis*) from the Florida Everglades and the Savannah River Site, South Carolina. Arch. Environ. Contam. Toxicol. 32:323-328.

Yess, N.J. (1993) US Food and Drug Administration Survey of Methyl Mercury in Canned Tuna. J. AOAC International 76:36-38.

Zallups, R.K. (1997) Renal toxicity of mercury. Pp. 633-652 in Comprehensive Toxicology vol. 7: Renal Toxicology (Sipes I.G., McQueen, C.A. and Gandolfi, A.J., eds) Pergamon Press, New York.

Zdanowicz, V.S. and D. Gadbois (1990) Contaminants in sediment and fish tissue from estuarine and coastal sites of the northeastern United States : data summary for the baseline phase of the National Status and Trends Program Benthic Surveillance Project, 1984-1986. : U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, Mass, 138 pp.

Zillioux, E.J., D.B. Porcella and J.M. Benoit (1993) Mercury cycling and effects in freshwater wetland ecosystems, Environ. Toxicol. Chem. 12: 2245-2264.